Gamesa

Global technology, everlasting energy

2012 Wind Turbine Blade Workshop

Albuquerque, May 30th 2012

Enrique J. García
Head of Blades Technology

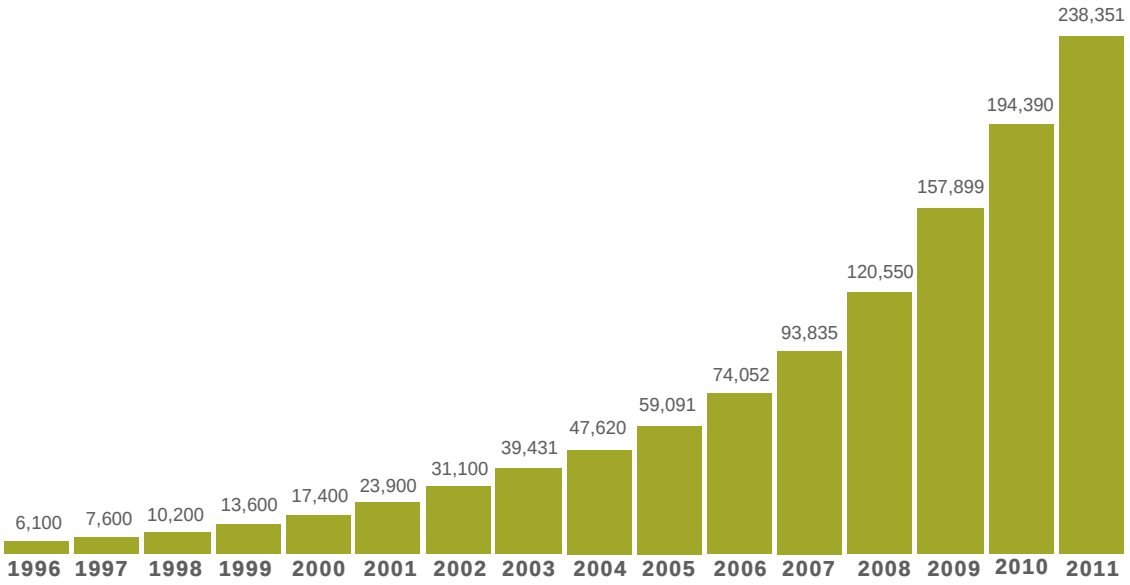
Wind industry

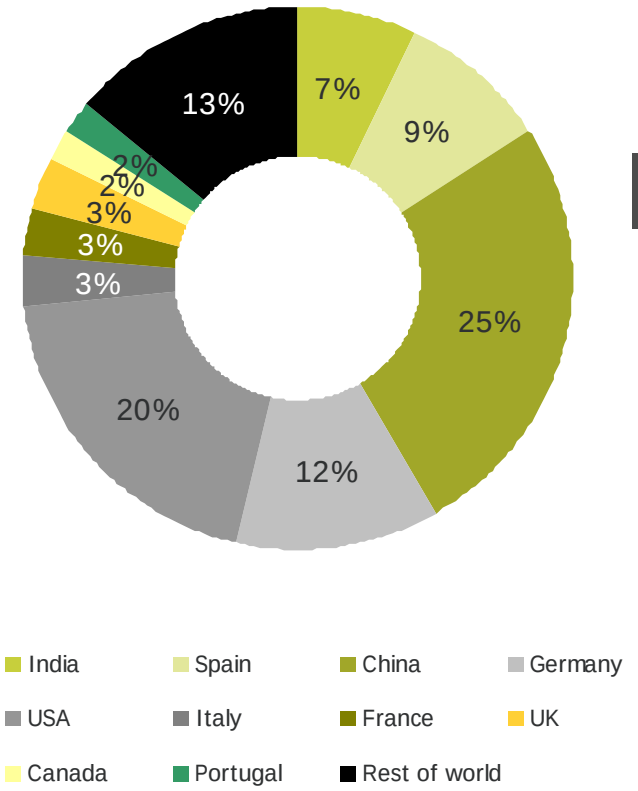
Mature Technology

In demand worldwide

Wind power capacity installed worldwide

Accumulated MW



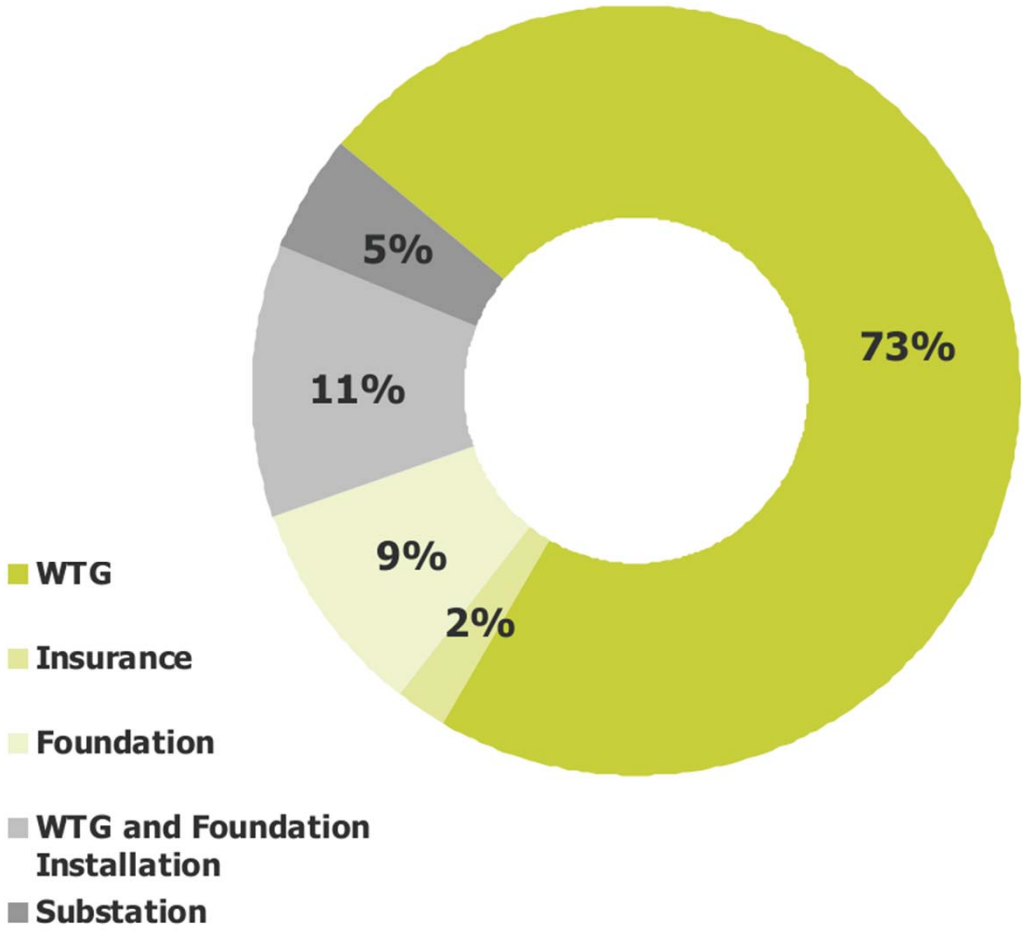


Source: GWEC

Cost of Energy (CoE) Explained

Main costs are Capital Expenditures

Onshore CAPEX breakdown



Main cost drivers

- **Wind turbine itself (75%)**
  Changes in the design to optimize CoE
  - **Larger blades** and taller towers to capture more energy (5% increase in Average Energy Production → 2.5% reduction of Cost of Energy!!!)
  - Reductions in materials, manufacturing costs
- **Logistics (11%)**

GAMESA

Global presence

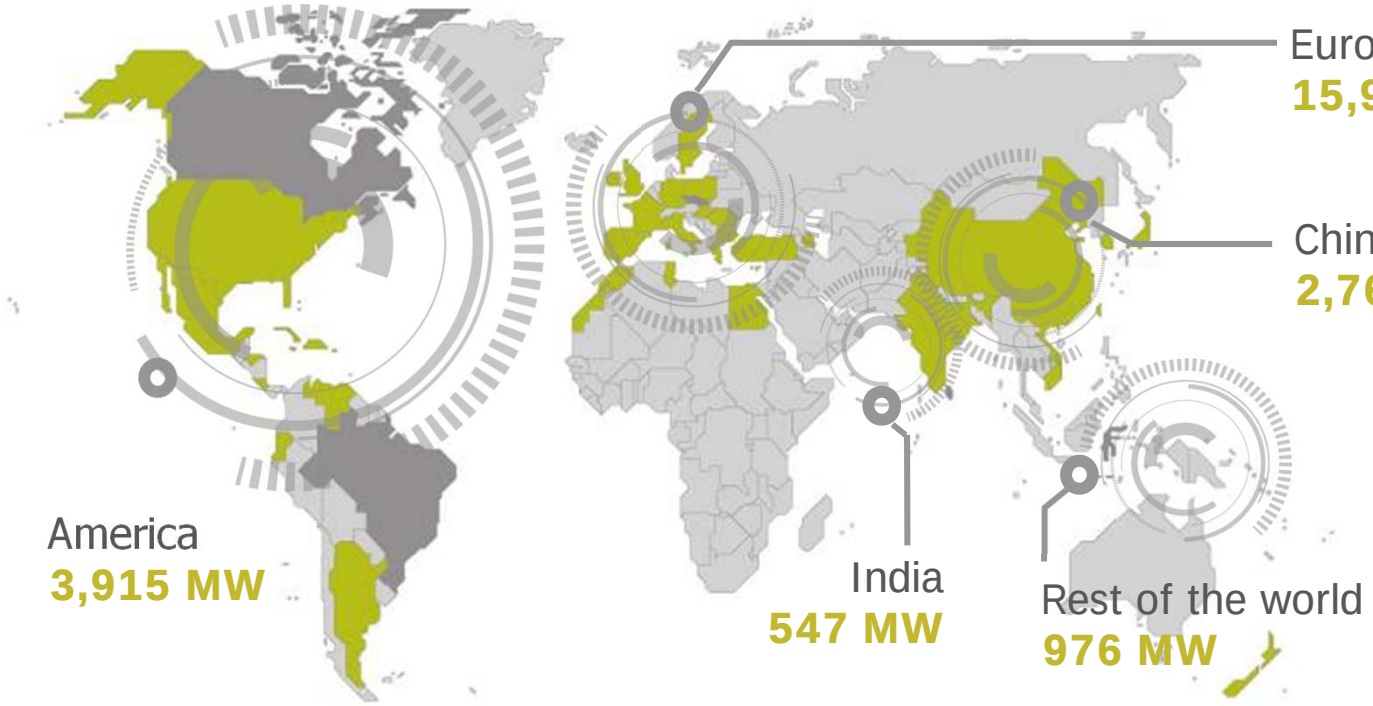
Productive base in leading markets

- 34 manufacturing plants around the world
- Opening of 5 production centres in the last two years in countries with a great potential in the wind sector: China, India and Brazil

Global presence

MW installed in leading markets

2011 total cumulative MW: **24,143 MW**

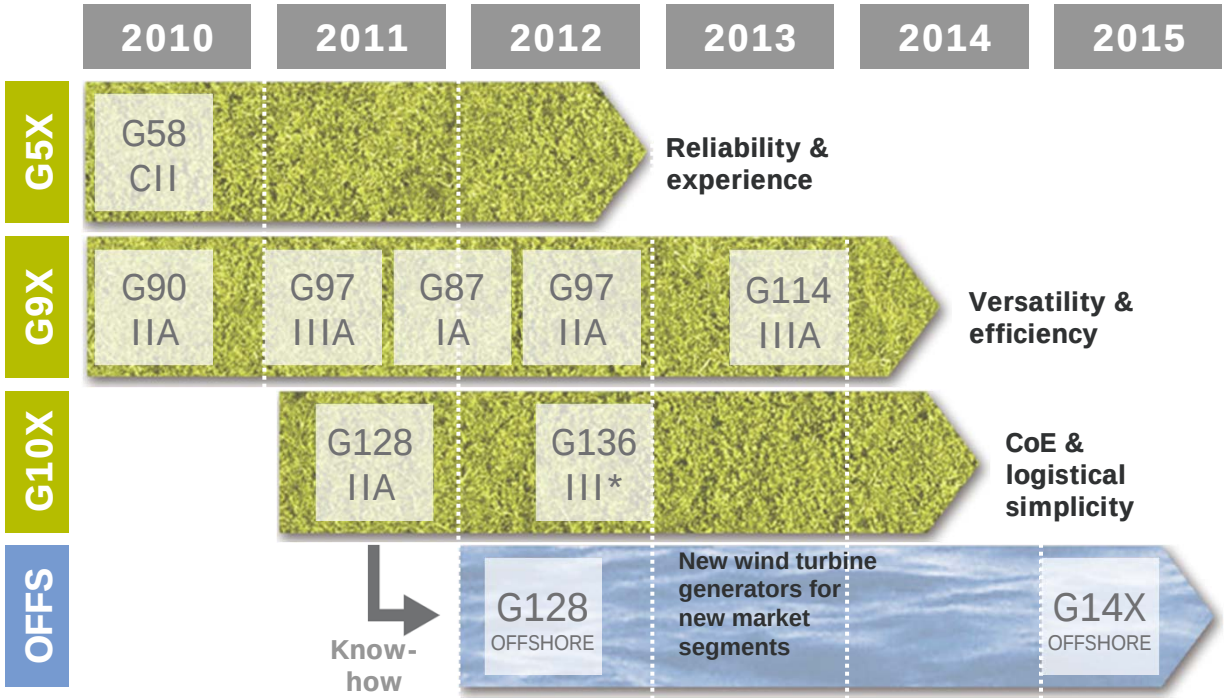


Markets with Gamesa installed base

Markets with first project already started in 2012

Technological innovation

Innovation roadmap until 2015



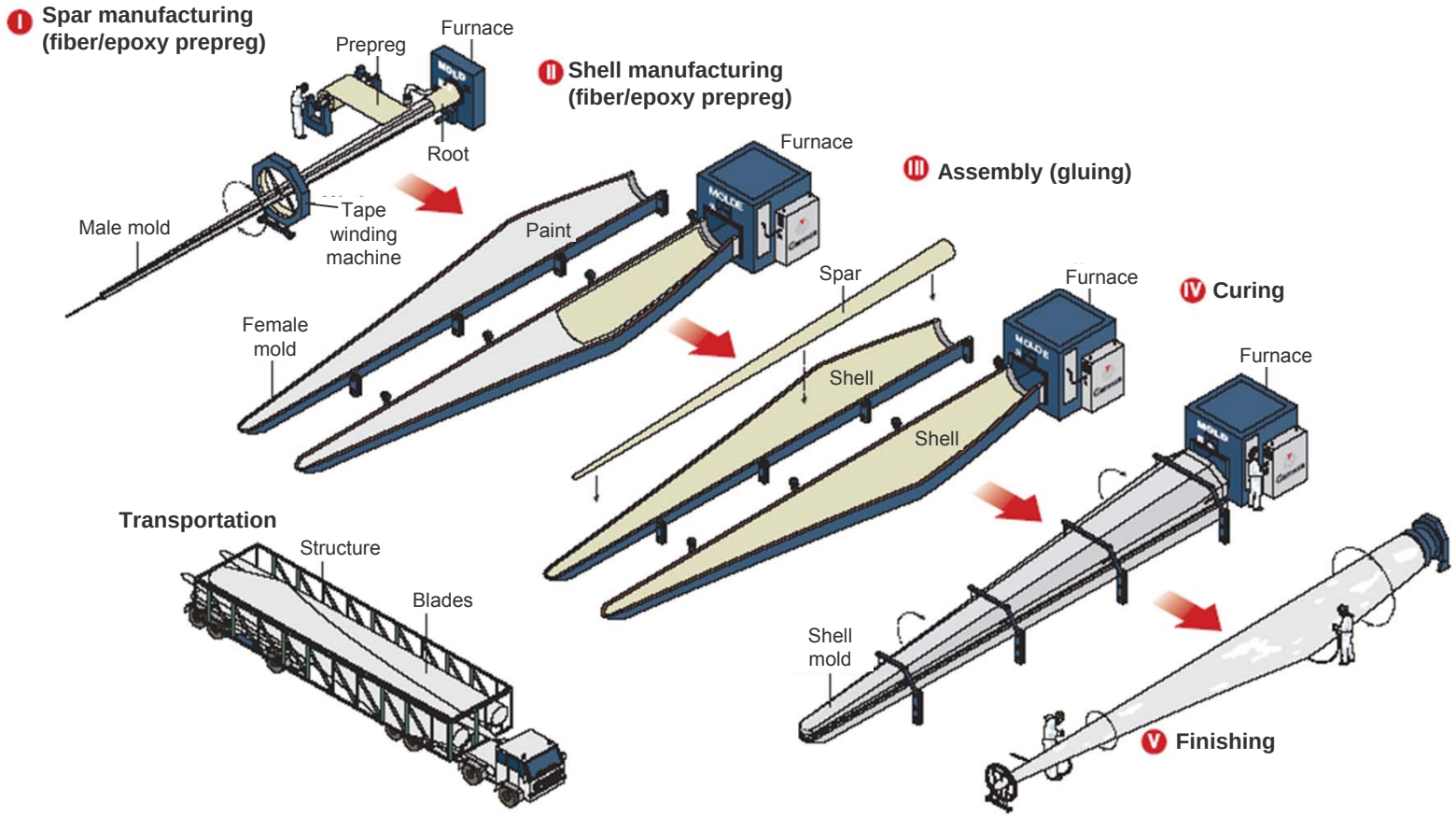
- Technology is critical to achieving CoE objectives and Gamesa has a clear road map for innovative products up to 2015
- Main objectives: To be a **benchmark in CoE** and adapt the product to the needs of the demand
- **Innovative Multi MW technologies** (already under development) and apply them to all platforms

* It will be classified as class S

GAMESA'S BLADES

G5X (850 kW) and G9X (2MW)

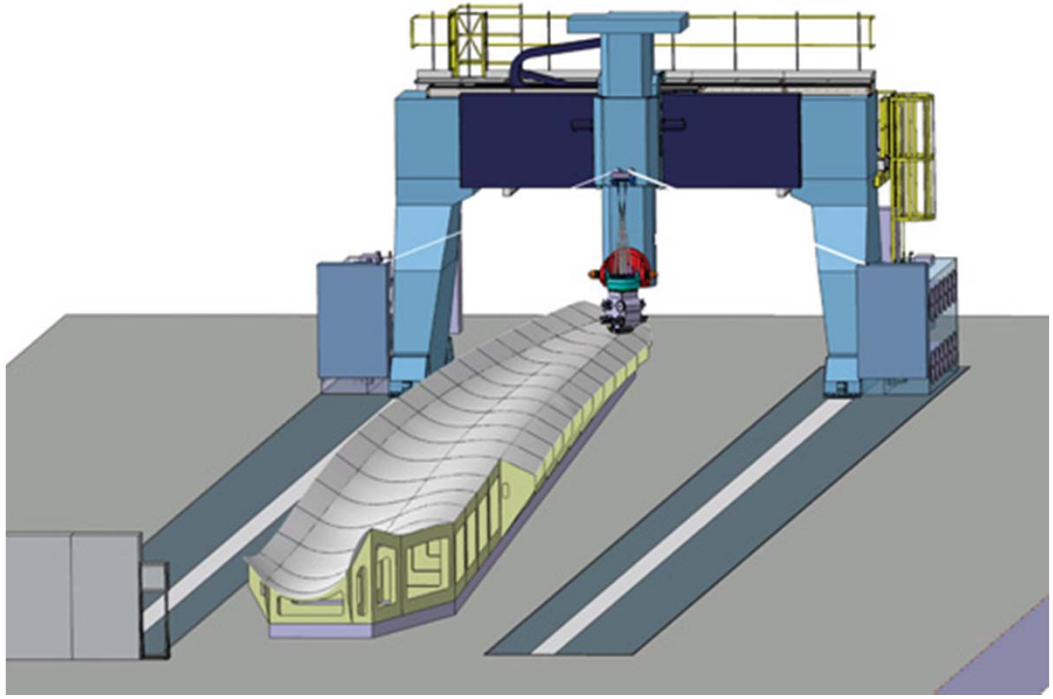
Hybrid Prepreg Blades



Fibramatic Project

100% Automated, Infusion Blade

Dry-Fiber Lamination Machine



Gamesa G10X-4.5 MW

Innoblade© MODULAR BLADE

G10X Blade Requirements

Logistics	Low Cost of Energy	
Transport Equipment as per Current G9X-2MW	Low Mass and Cost	Low Noise and High AEP
↓	↓	↓
Modular Blade	New Structural Concept	New Family of Low Noise Airfoils

INNOBLADE®

Gamesa G10X-4.5 MW

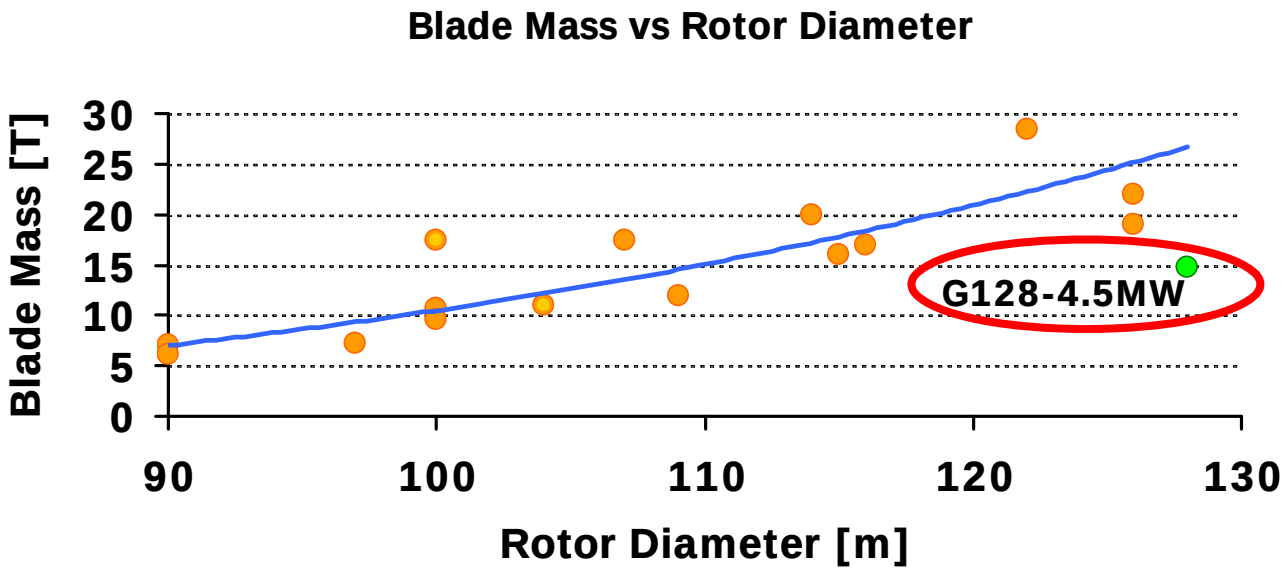
Innoblade© MODULAR BLADE

INNOBLADE®

Modular Blade	New Structural Concept	Low Noise Airfoils

Blade Mass 40% Lower than the Current Multimegawatt Blade Market

Prepreg, Infusion and Pultrusion are Combined in an Optimized Structure



Gamesa G10X-4.5 MW

Innoblade© MODULAR BLADE

Technological leader

Wide range of technologies to choose from to fully optimize CoE for each new design and location

- Wide range of materials
  - Glass, Carbon, different resins, adhesives, cores,...
- Wide range of possible structures
  - From traditional shells/webs to torsion box/shells
  - From one-piece to modular blades
- Wide range of manufacturing technologies
  - From fully manual to fully automated
    - Hand layup, Winding, Fiber Placement
    - Assembly, finishing,... also automated if needed
  - Infusion, pultrusion, prepreg

- Each component can be fully optimized in terms of cost and performance to minimize the overall wind turbine Cost of Energy


GAMESA
Global Technology
Everlasting Energy
Thank you for your attention
Q&A
engarcia@gamesacorp.com
Gamesa